## AMENDMENTS TO THE CLAIMS

**This listing of claims will replace all prior versions and listings of claims in the application:**

## LISTING OF CLAIMS:

1. (Cancelled).

2. (Currently Amended): ~~The method of claim 1~~ A method for indexing feature vector data space comprising the step of:

(a) adaptively approximating feature vectors on the basis of statistical distribution of feature vector data in the feature vector data space, wherein the step (a) further comprises the steps of:

(a-1) measuring the statistical distribution of the feature vector data in the feature vector data space;

(a-2) estimating marginal distribution of the feature vector data using the statistical distribution;

(a-3) dividing the estimated marginal distribution into a plurality of grids in which a probability of disposing the feature vector data in each grid is uniform; and

(a-4) indexing the feature vector data space using the divided grids.

3. (Original): The method of claim 2, further comprising prior to step (a-4), the step of updating the grids on the basis of a previous probability distribution function and an updated probability distribution function, when new data is received.

4. (Original): The method of claim 2, wherein step (a-4) further comprises indexing using vector approximation (VA) files.

5. (Original): The method of claim 2, wherein a number of the plurality of grids is determined by a number of bits assigned to the dimension.

6. (Original): The method of claim 2, wherein step (a-2) further comprises the steps of:

(a-2-1) defining a probability distribution function using a weighted sum of a predetermined distribution function; and

(a-2-2) obtaining an estimated probability distribution function by estimating predetermined parameters using the probability distribution function defined in the step (a-2-1).

7. (Original): The method of claim 6, wherein step (a-2-2) further comprises obtaining the estimated probability distribution function by estimating the predetermined parameters using all N predetermined data in each estimation, wherein N is a positive integer, on the basis of an expectation-maximization algorithm using the probability distribution function defined in the step (a-2-1).

8. (Original): The method of claim 6, wherein the predetermined distribution function is the Gaussian function.

9. (Original): The method of claim 6, wherein the probability distribution function of step (a-2-1) is a one-dimensional signal, p(x), wherein $p(x) = \sum_{j=1}^{N} p(x|j)P(j)$, and wherein

$p(x|j)$ is defined as

$$p(x|j) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{ -\frac{(x - \mu_j)^2}{2\sigma_j^2} \right\},$$

wherein coefficient P(j) is a mixing parameter that satisfies the following criterion

$0 \leq P(j) \leq 1$ and $\displaystyle\sum_{j=1}^{M} P(j) = 1$.

10. (Original): The method of claim 6, wherein the estimated probability distribution

function of step (a-2-2) is obtained by finding $\Phi_j$, $j=1, \ldots, M$, which maximizes

$\Phi(\Phi_1, \ldots, \Phi_M) = \displaystyle\prod_{l=0}^{N} P(v[l] | (\Phi_1, \ldots, \Phi_M))$, where parameters v[l], l=1, ..., N, is a given data set.

11. (Original): The method of claim 10, wherein the estimated parameters of step (a-2-

2) are updated according to the following equations

$$\mu_j^{t+1} = \frac{\displaystyle\sum_{l=1}^{N} p(j|v[l])^t \, v[l]}{\displaystyle\sum_{l=1}^{N} p(j|v[l])^t},$$

$$(\sigma_j^2)^{t+1} = \frac{\displaystyle\sum_{l=1}^{N} p(j|v[l])^t (v[l] - \mu_j^t)^2}{\displaystyle\sum_{l=1}^{N} p(j|v[l])^t}, \text{ and}$$

$$P(j)^{t+1} = \frac{1}{N} \displaystyle\sum_{l=1}^{N} p(j|v[l])^t,$$ wherein t is a positive integer representing a number of

iterations.

12. (Original): The method of claim 11, wherein the estimated parameter set of step (a-2-

2) using N data v[l] is given as $\{ P(j)^N \mu_j^N, (\sigma_j^2)^N \}$, and the updated parameter set for new data

v[N+1], coming in, is calculating using the following equations:

$$\mu_j^{N+1} = \mu_j^N + \theta_j^{N+1}(v[N+1] - \mu_j^N),$$

$$(\sigma_j^2)^{N+1} = (\sigma_j^2)^N + \theta_j^{N+1}[(v[N+1] - \mu_j^N)^2 - (\sigma_j^2)^N],$$

$$P(j)^{N+1} = P(j)^N + \frac{1}{N+1}(P(j|v[N+1]) - P(j)^N), \text{ and}$$

$$(\theta_j^{N+1})^{-1} = \frac{P(j|v[N])}{P(j|v[N+1])}(\theta_j^N)^{-1} + 1.$$

13. (Original): The method of claim 11, wherein the step (a-2-2) further comprises:

measuring a change of a probability distribution function which is defined as

$$\frac{\rho = \int(\hat{p}_{old}(x) - \hat{p}_{new}(x))^2 dx}{\int \hat{p}_{old}(x)^2 dx}$$ for each dimension, wherein a previous probability distribution

function is $\hat{P}_{old}(x)$, and an updated probability distribution function is $\hat{P}_{new}(x)$; and

updating an approximation for the dimension if $\rho$ is larger than a predetermined threshold

value.

14. (Original): The method of claim 2, wherein step (a-3) further comprises dividing a

probability distribution function into the plurality of grids to make areas covered by each grid

equal, wherein the plurality of grids have boundary points defined by c[l], $l = 0, \ldots, 2^b$, where b

is a number of bits allocated and wherein the boundary points satisfy a criterion,

$$\int_{c[l]}^{c[l+1]} \hat{p}(x)dx = \frac{1}{2^b}\int_{c[0]}^{c[2b]} \hat{p}(x)dx,$$ and wherein the estimated probability distribution function is

$\hat{p}(x)$.

5

15. (Currently Amended): The method of claim [[1]] 2, wherein the feature vector data space is in a plurality of dimensions and the feature vector data is in one dimension.

16. (Previously Presented): The method of claim 2, wherein the feature vector data space is in a plurality of dimensions and the feature vector data is in one dimension.